WHAT IS CLAIMED IS

1. A method for increasing the number of users capable of communicating over a wireless network, comprising:

transmitting information in a digital format from multiple separate wireless transmitters on the same frequency; and,

separating the transmitted signals which arrive corrupted a receiver as a corrupted received signal so as to remove the interference of one signal from that of another using a Viterbi decoder to perform an exhaustive search and a joint parameter estimation, whereby multiple simultaneously transmitted signals may be recovered without requiring new waveforms or new frequency slots or time slots.

2. The method of Claim 1, wherein the separating step includes the use of a filter for separating the interfering signals, the structure of which is derived by estimating power, phase, baud timing offset and frequency offset of the individual received signals corresponding to each of the transmitted signals that comprise the corrupted received signal.

3 The method of Claim 1, wherein the separation is done in realtime using an optimum asynchronous multi-user detection algorithm.

4. The method of Claim 3, wherein the separating step includes the step of separating the received signals in terms of power so as to group the signals in terms of decreasing power by iteratively processing and stripping off the signals in the highest power group, thus to limit the total amount of processing required by the exhaustive search.

5 The method of Claim 3, wherein the separating step includes the step of intersymbol interference tail chopping, thus to limit the number of states in the Viterbi decoder and thus the processing time by at least an order of magnitude.

6 The method of Claim 2, and further including at the receiver the step of providing an initial joint parameter estimation and using the initial joint parameter estimation to define the structure of the filter used in separating the received signals.

7 The method of Claim 6, and further including the step of refining the initial joint parameter estimates based on measured power, phase, baud timing offset and frequency offset of a received signal.

8. The method of Claim 7, wherein the received signal is received in the absence of other user interference over an acquisition channel prior to assignment to a traffic channel with other users already transmitting, and wherein an initialization signal is sent over the acquisition channel for the network.

9. The method of Claim 1, wherein the total number of transmitters is K and wherein the grouping of signals by power reduces K into subgroups containing more than k users in each, where k is not so large as to preclude realtime processing.

10. The method of Claim 1, wherein n is the length of the intersymbol interference and wherein n is reduced with tail chopping, thus to reduce the number of states per stage in the processing of the received signals from many hundreds of gigaflops to megaflops which can be accommodated by the computational capacity of a wireless handset.

11. In a digital wireless communications network, a system for reducing the computational complexity of multi-user detection using a Viterbi detection algorithm so as to permit the system to separate multiple signals transmitted at the same frequency and thus permit signal packing, comprising:

a receiver for receiving multiple digital signals transmitted on the same frequency, said receiver having a multi-user detector for implementing an exhaustive search strategy for separating the simultaneously arriving signals;

a power responsive grouping unit for separating signals received at said receiver into groups, said multi-user detector first processing the group having the highest power, thus to reduce processing complexity by processing only one group at a time; and,

a reduced state Viterbi decoder which removes from consideration a predetermined number of intersymbol interference tails, thus to minimize the complexity, whereby signal

separation for a number of simultaneously transmitted signals at the same frequency may be accomplished by the megaflop processors available for wireless handsets.

12. A method for reducing the computational complexity of separating two digital signals that exist simultaneously on the same communication channel, comprising the step of:

using parameter estimation and a Viterbi algorithm to perform an exhaustive search that jointly detects and decodes all the bits corresponding to all the transmitted signals on the same channel, with a shortened signature pulse used to model intersymbol interference, chopping off much of the intersymbol interference tails for reducing the time required by the exhaustive search, thereby reducing the amount of computation to a level supported by processors in wireless handsets.

13. A method for reducing the computational complexity of separating two digital signals that exist simultaneously on the same communication channel, comprising the step of:

using parameter estimation and a Viterbi decoder to perform an exhaustive search algorithm to separate the bit streams corresponding to all the signals in the channel, the signals being separated into groups by received power, with the signals in the highest power group being processed first, thereby to limit computational complexity by doing an exhaustive search only on one group of signals at a time.

14. The method of Claim 13, wherein the groupings are defined by a difference in power of 6dB.